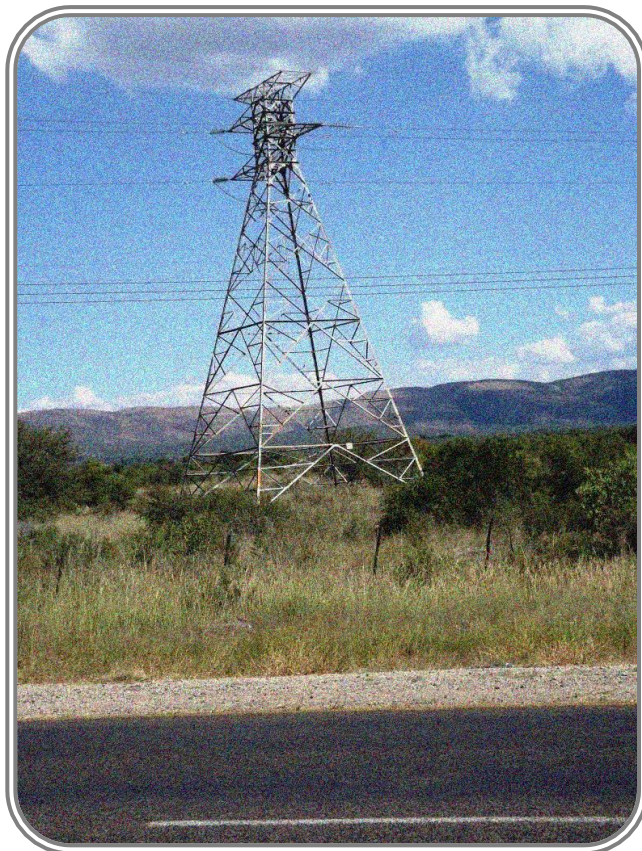




PROPOSED
DE WILDT 50 MW PV SOLAR PLANT
IN THE MADIBENG LOCAL MUNICIPALITY
IN THE BOJANALA DISTRICT OF
NORTH WEST PROVINCE



TRAFFIC IMPACT ASSESSMENT

**PROPOSED DEWILDT 50MW PV SOLAR PLANT IN THE MADIBENG
LOCAL MUNICIPALITY IN THE BOJANALA DISTRICT OF
NORTH WEST PROVINCE**

TRAFFIC IMPACT ASSESSMENT

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PROPOSED DEWILDT 50 MW PV SOLAR PLANT IN THE MADIBENG LOCAL MUNICIPALITY IN THE BOJANALA DISTRICT OF NORTH WEST PROVINCE

TRAFFIC IMPACT ASSESSMENT

APRIL 2016

1. SCOPE

A 50 MW PV solar electricity generation plant with associated infrastructure (88 KV transmission line) is proposed on Portions 15, 27 and 28 of the farm Schietfontein 437 JQ south-west of Ga Rankuwa in the Madibeng Local Municipality area in the Bojanala District in the North West Province.

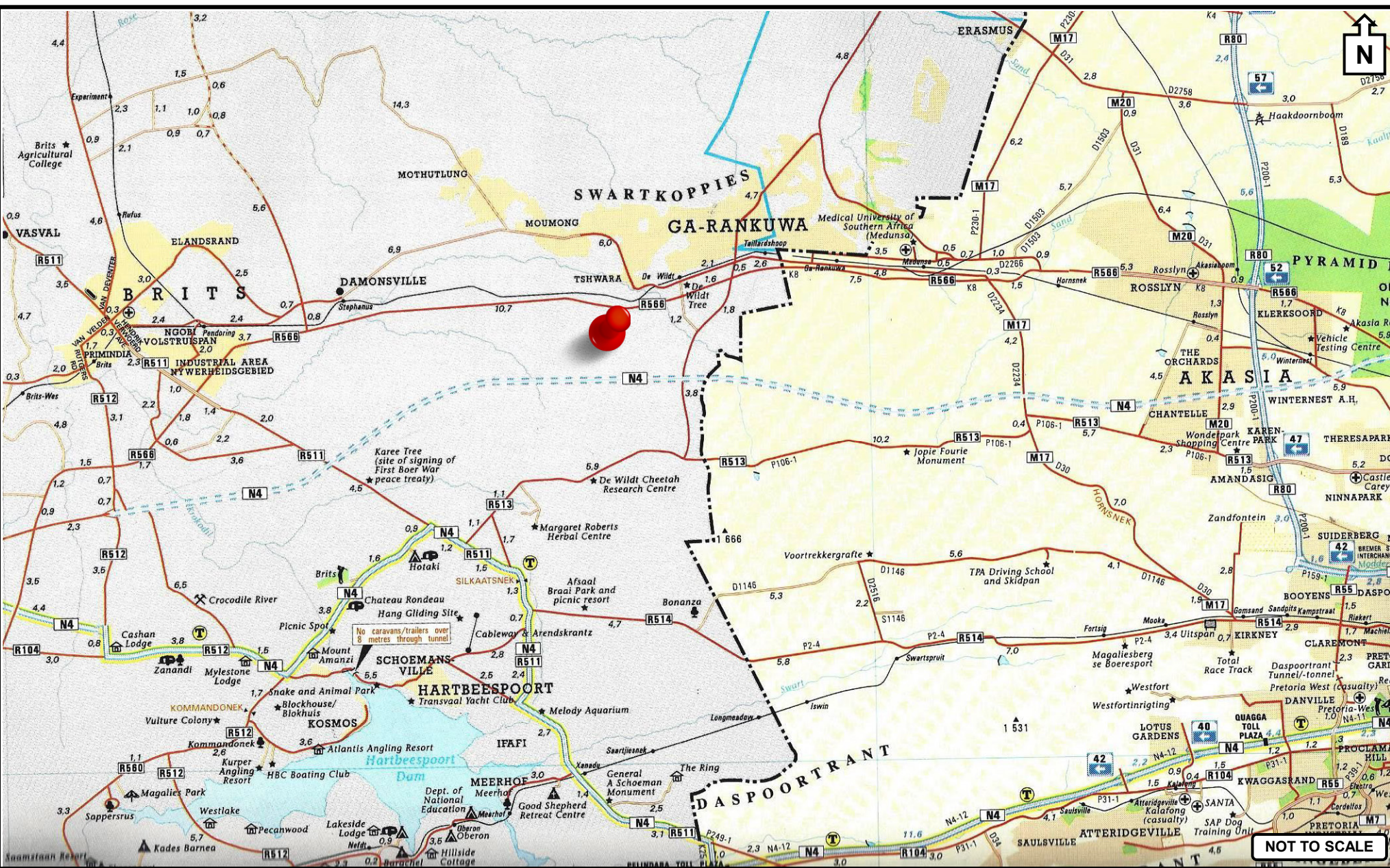
A locality map is attached in Figure 1 and a photographic record of the study area is attached in Annexure A.

Access to the site both during construction and the operational phase will be from road R566. R566 is a provincial road and has been designated as route K8 in the major road network planning of both Gauteng and North West province and is planned as a future dual carriageway road.

Tech IQ Consulting Engineers has been appointed to assess the traffic impact of the proposed development both during construction and the operational phase and to recommend appropriate mitigating measures as part of the EIA process.

The report will include the following:

- Site description and proposed development
- Transportation system
- Traffic analysis
- Capacity analysis
- Proposed road improvements and mitigation measures
- Conclusion and recommendation.



PROPOSED DEWILDT SOLAR PLANT

Locality plan



FIGURE 1

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 *Site Description*

The site is located on the southern side of Road R566, approximately 9 km west of the George Mokhari Hospital and 15 km east of the town of Brits. R566 runs parallel to the N4 Bakwena toll road and links the town of Brits in the west with the Rosslyn industrial area and the R80 Mabopane freeway in the east.

The site is approximately 330 ha in extent and from a traffic engineering point of view it can be considered as vacant.

2.2 *Proposed Development*

The proposed DeWildt PV solar plant provides for the generation 50 MW electrical power. The proposed site layout is illustrated on Figure 2 and includes the following:

- Internal and external access roads and a small parking area
- Fencing of the plant and video security control systems
- Foundations / mini piles for the mounted Photovoltaic arrays
- Electricity access point for the construction phase, operation phase (if necessary) and UPS (Uninterrupted Power Supply) devices
- Water access point and / or water extraction on-site from borehole (s), water supply pipelines, water treatment
- Sewerage system and stormwater collection system (if necessary)
- Workshop and warehouse
- A control building with offices
- Cabling lining Photovoltaic strings and other internal cabling
- Medium voltage stations designed to host DC / AC inverters and medium voltage power transformers
- A high voltage sub-station with high-voltage power transformers, stepping up the voltage to the voltage of the Eskom's grid
- 88KV transmission line to loop in and out the sub-station.

During the construction phase, the site may be provided with the following:

- Water access point and water extraction on-site borehole(s) point, water supply pipelines, water treatment facilities
- Pre-fabricated buildings that will be removed at the end of the construction phase.

This report only addresses the solar plant and not any future use of the remaining land.

3. TRANSPORTATION SYSTEM

3.1 Road Network Hierarchy

The solar plant is served by a proper network of major roads that link the project with residential areas where employees may be located, as well as industrial areas such as Brits, Rosslyn, Rustenburg, Pretoria, Johannesburg and the West Rand.

There are also a number of planned future roads that will not serve the project during the construction phase, but which must be taken into consideration as far as long term access during the operational phase of the project is concerned. The provincial major road planning is illustrated on Figure 3.

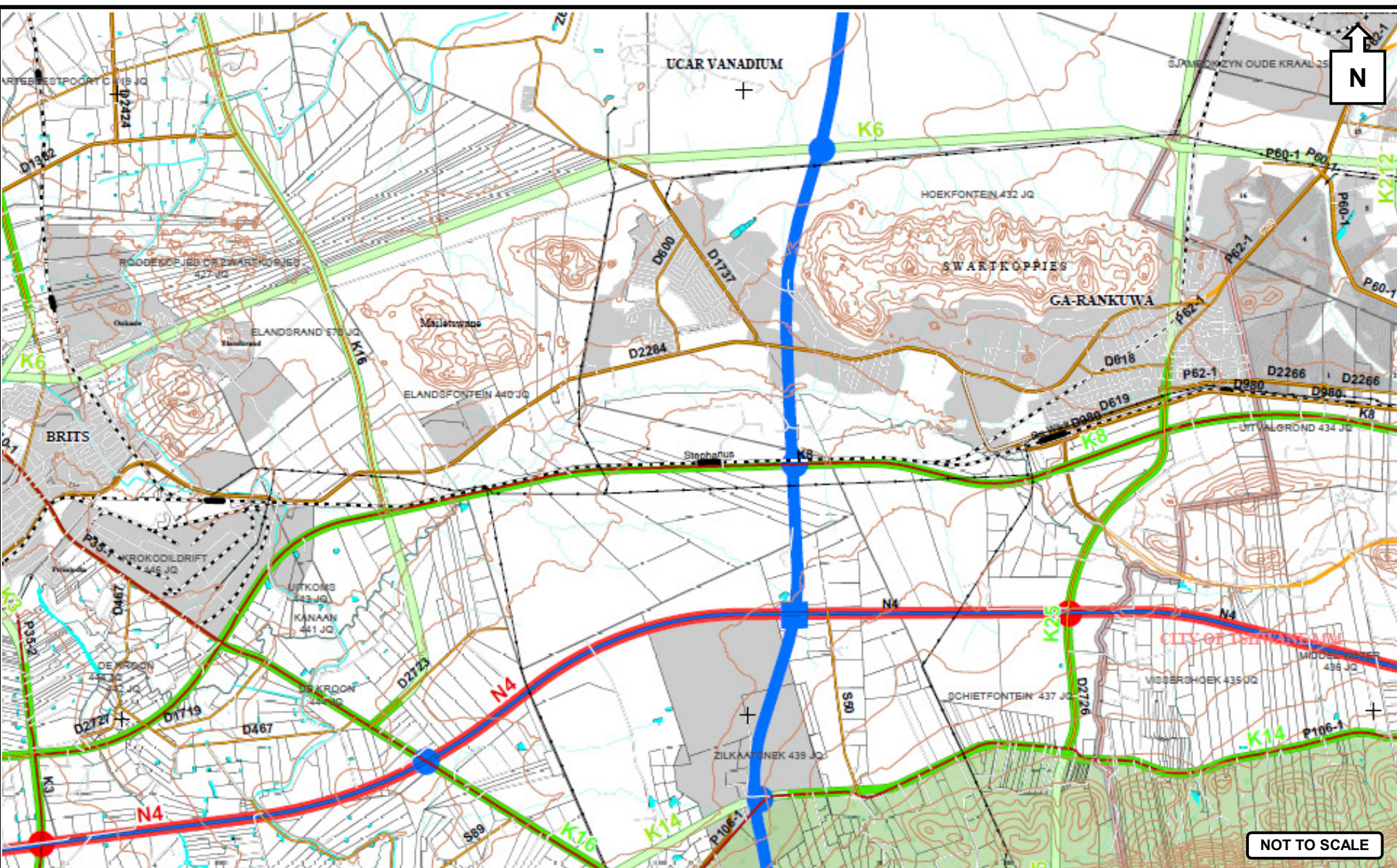
The hierarchy of roads in the vicinity of the site is tabulated below.

CLASSIFICATION	DESCRIPTION
Class 1 principal arterials Full control of access. Access at interchanges only	<ul style="list-style-type: none"> • N4 Bakwena national toll road east-west direction, 2 km from site. Route to Rustenburg 70 km west and Pretoria 30 km east • Planned PWV6 freeway north-south approximately 2 km west of the site. The interchange position would have an impact on the position of intersections on K8 (including access to the site)
Class 2 major arterials Strict control of minimum spacing between intersections	<ul style="list-style-type: none"> • R566. East-west route across site and only road access to the solar plant. Existing two-way two lane road. Designated as K8 • M21 north-south road (D2726) provides access to N4 (west). Designated as K25 • R511. Road between Brits and northern part of Johannesburg. Also provides access to N4 Bakwena toll road and N4 toll road between Pretoria and Hartebeespoort Dam. Designated as K16. Provincial road P35-1

It is concluded that the site enjoys excellent accessibility via the national toll roads and the provincial major roads of Gauteng and North West province.

3.2 Rail

The Brits-Ga Rankuwa-Pretoria railway line runs along the northern part of the site. However, it is unlikely to play a significant role in either passenger or freight transport to the site. All access to the site, both passenger and freight, is expected to be via the road network.



PROPOSED DEWILDT SOLAR PLANT

Planned provincial major road network

FIGURE 3

3.3 Non-Motorised Transport

R566 is a high speed rural mobility route and is not intended for pedestrians or bicycle travel. The distances to residential areas are such that it is unlikely for people to walk to or from the site.

If construction staff is to be accommodated on site, arrangements must be made for transport to shops and other amenities in Brits or Ga Rankuwa for their comfort, convenience and safety.

3.4 Public Transport

Both bus and minibus taxi public transport was observed along R566. During 10.5 hours of traffic counts, 248 taxis were observed on the R566, both directions of travel combined. It can be expected that taxi services will be provided to and from the site along R566.

Facilities for the loading and off-loading of passengers should be provided on site or at the access gate to avoid the concentration of passengers and informal services to passengers along the busy provincial road.

3.5 Goods Transport (Freight)

During construction freight transport to the site will be of vital importance. All major roads in the vicinity experience a presence of heavy goods vehicles, including bulk carriers of mining products.

A total of 688 heavy vehicles were observed on R566 during the 10.5 hour count. It is interesting to note that truck volumes are high throughout the day, but are relatively low up to 08:00 in the morning when employees are expected to arrive at the site.

4. TRAFFIC ANALYSIS

4.1 Traffic Counts

Traffic counts were undertaken on 18 April 2016 by independent service provider, Traffic Support Services (BH Wijburg) and are attached in Annexure B.

Peak hour volumes during the AM, Midday and PM peak hours, as well as the full 10.5 hours of observation, are illustrated on Figure 4.

The composition of the traffic stream in terms of light vehicles, taxis and heavy vehicles is illustrated on Figure 5.

4.2 Traffic Patterns

Traffic volumes are substantial throughout the day (typically between 400 and 600 vehicles per hour along R566). Traffic is concentrated during the AM and PM peak periods and peak hour volumes are approximately double the off-peak volumes.

It is important to note that AM peak traffic starts early in the morning with the peak hour between 06:15 and 07:15. This is explained by the long travel time to areas with a high concentration of employment opportunities. Delivery trucks would therefore not coincide with the peak hour traffic on the road network.

4.3 Trip Generation

i. Construction

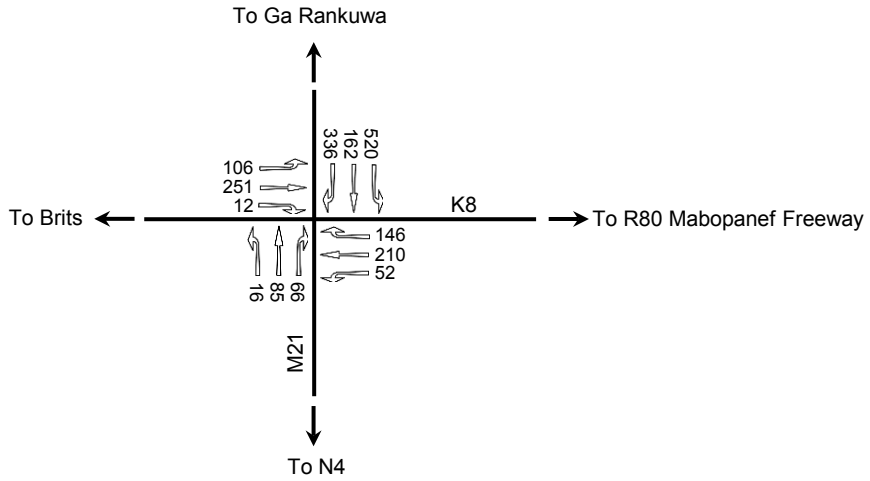
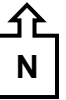
Construction activities include site preparation, the installation of utilities, building construction and the manufacturing, assembly and installation of the PV solar plant.

Traffic generation is expected to include the following:

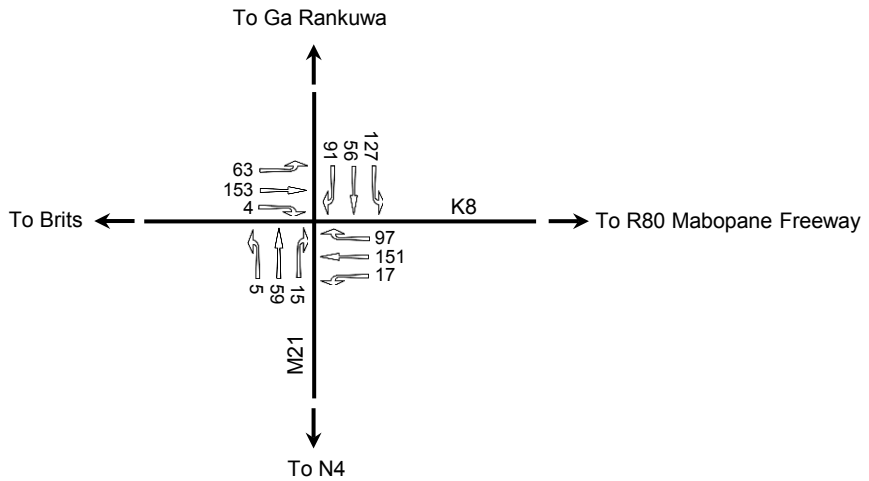
- Delivery of construction equipment and machinery
- Delivery of materials for construction of infrastructure
- Delivery of equipment and materials for the plant
- Public transport for employees
- Private transport for staff
- Visitors and management
- Demobilisation.

Freight transport can be expected throughout the day and due to the travel distance from suppliers and industrial areas, deliveries are not expected during commuter peak periods. Deliveries are expected to arrive after the AM peak due to travel time from the origin of the trip (e.g. Johannesburg, Pretoria, West Rand or Rustenburg) and depart well before the PM peak because delivery vehicles have to off-load and depart on their return journey.

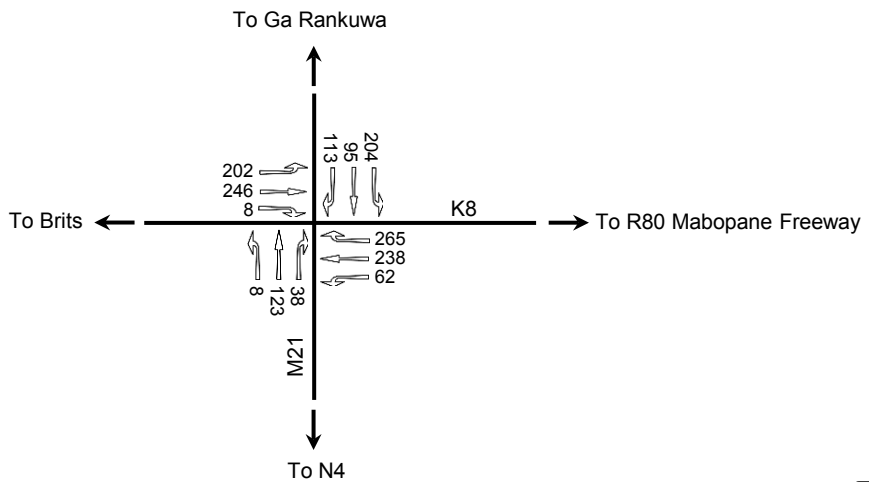
AM PEAK HOUR



MIDDAY PEAK HOUR



PM PEAK HOUR

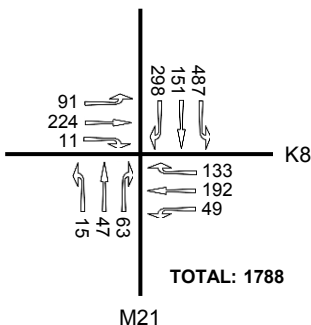


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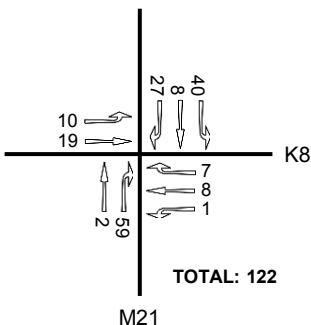
AM PEAK HOUR



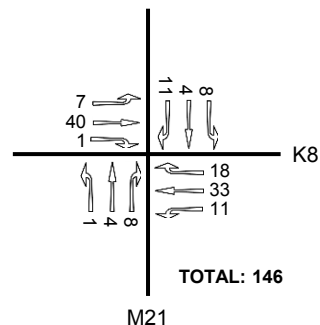
LIGHT VEHICLES (06:15-07:15)



TAXIS (06:00-07:00)

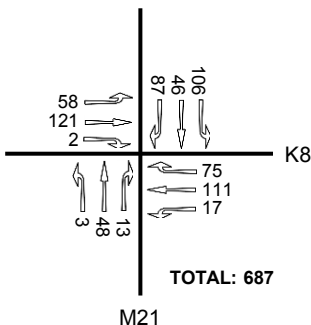


HEAVY VEHICLES (08:30-09:30)

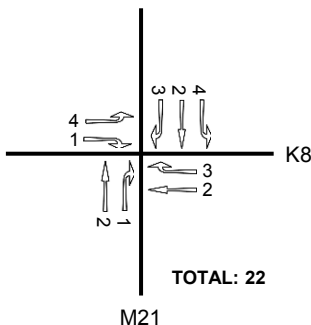


MIDDAY PEAK HOUR

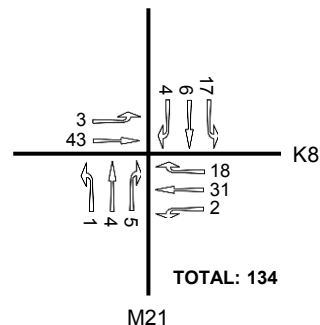
LIGHT VEHICLES (12:15-13:15)



TAXIS (11:45-12:45)

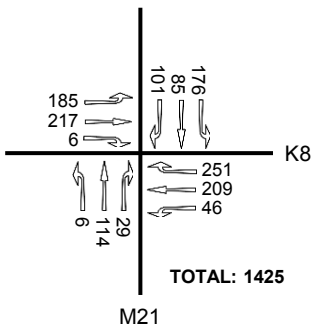


HEAVY VEHICLES (12:00-13:00)

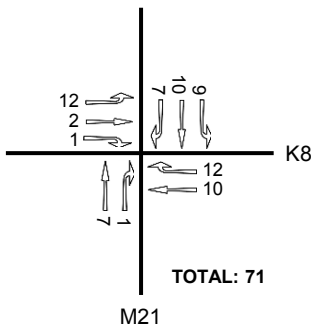


PM PEAK HOUR

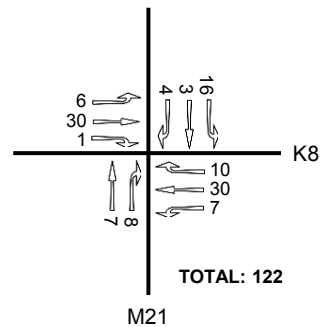
LIGHT VEHICLES (16:15-17:15)



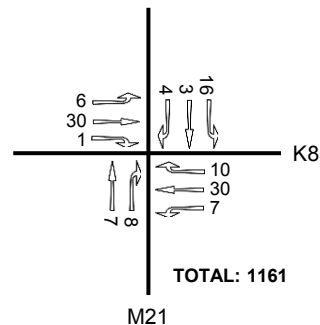
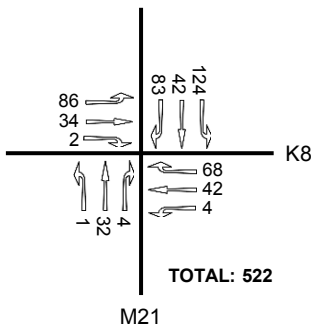
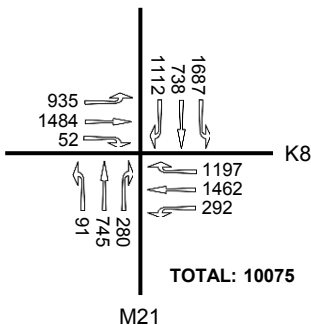
TAXIS (17:00-18:00)



HEAVY VEHICLES (15:00-16:00)



TOTAL DAILY VEHICLES: 10.5 HOURS



NOT TO SCALE

Heavy vehicles already represent approximately 10% of the total daily traffic and 15% of off-peak traffic (08:00-16:00).

It is therefore concluded that the impact of freight transport on the capacity and traffic operations on the access routes will not be significant, but that attention must be given to the design of the access to the site on R566 and the receiving gate for deliveries, as well as traffic management in the case of the delivery of heavy machinery or equipment that may include abnormal loads.

ii. Passenger transport

A study by the University of California at Berkeley, "Solar Energy Job Creation in California", George Ban-Weiss et al, indicated that 20 manufacturing job years and 13 installation job years are created for each megawatt power of solar panels installed (Stalix.com). The University's Renewable and Appropriate Energy Laboratory (RAEL) synthesised 15 job studies into a Green Jobs Calculator (2010). The RAEL study reports that solar has 7.45-10.5 jobs per megawatt of installed capacity.

Green Jobs is an estimate of the direct employment potential of a greening South African economy. (*Green Jobs: An Estimate of the Direct Employment Potential of a Greening South African Economy, IDC of SA Ltd, DBSA, Trade and Industrial Policy Strategies, 2011*).

The following jobs per MW are estimated:

- Seven direct full time jobs in construction
- 16.8 direct full-time manufacturing jobs
- 0.7 operation and maintenance jobs.

The number of pcu / hour is estimated below.

If it is assumed that 75% of the installation jobs are created on site, the number of employees on site is estimated at 490 persons for the 50MW plant based on 13 installation staff per MW.

Installation staff per MW	13 persons
Total staff for 50MW plant	650 persons
75% jobs on site	490 persons
Number of persons per hour (all staff arrive / depart during hour)	490 persons / hour
Peak characteristic 50% of employees arrive in peak 15 minutes	980 persons / hour
20% employees by private vehicles @ 1.5 persons / vehicle	130 pcu / hour
40% employees by bus @ 40 persons per bus @ 3 pcu / bus	29 pcu / hour
40% employees by minibus taxi @ 15 persons / taxi @ 1.2 pcu / taxi	31 pcu / hour
TOTAL	190 pcu / hour
Directional split 90:10	171:19 pcu / hour

iii. *Operation and maintenance*

At 0.7 jobs per MW during the operational phase of the plant, the peak hour trips can be calculated as follows:

Total employment (50 @ 0.7)	35 persons
Jobs on site (80%)	28 persons
Main daytime shift (80%)	22 persons
Peak factor 50% in 15 minutes public transport	44 persons / hour
80% employees minibus taxi @ 9 persons / vehicle @ 1.2 pcu / minibus	4.7 persons / hour
Private transport 20% @ 1.2 persons / vehicle	7.3 pcu / hour
TOTAL	12 pcu / hour
Directional split 85:15	10:2 pcu / hour

It is concluded that during the operational phase the traffic impact will be negligible and in terms of the *Manual for Traffic Impact Studies* does not warrant any further assessment.

4.4 *Trip Distribution and Assignment*

The trip distribution assumed in the analysis is as follows:

R566 west from Brits	20%
R566 east from Mabopane, Pretoria North, Pretoria via N4	55%
M21 south (N4 west)	10%
M21 north Ga Rankuwa	15%
TOTAL	100%

The assignment of peak hour traffic generated by the solar plant on the road network is illustrated on Figure 6.

4.5 *Horizon Year*

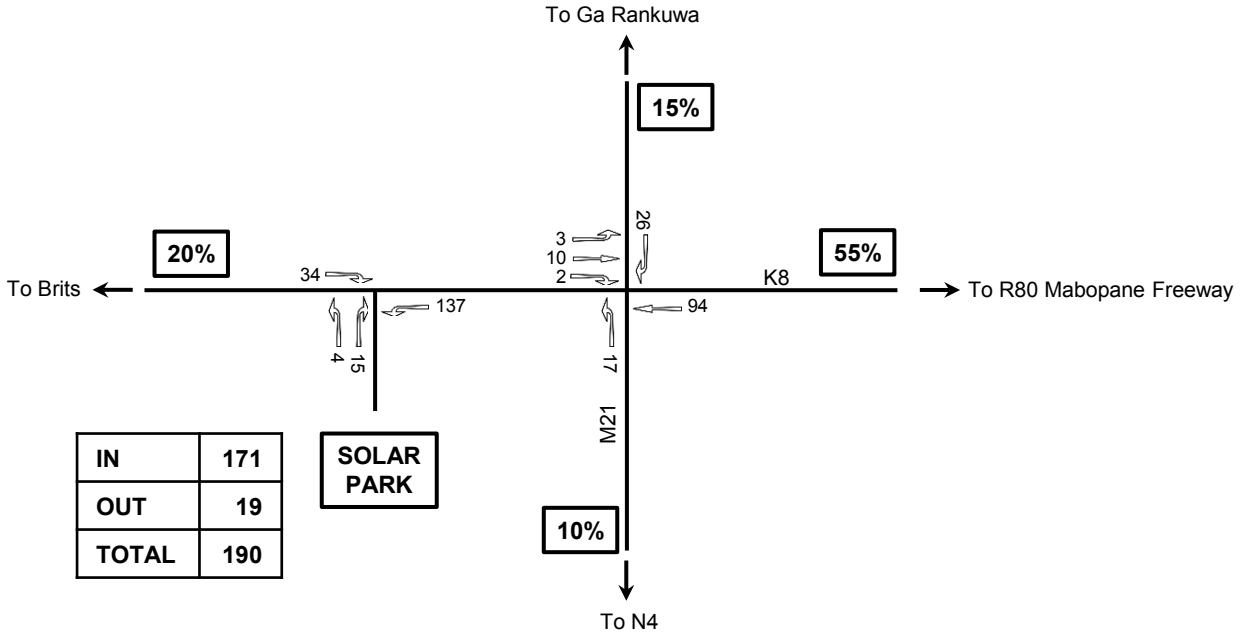
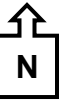
It is assumed that the solar plant will be erected during the next two years and 2018 has been selected as horizon year for the traffic analysis. A 3.0% p.a. moderate growth in the background demand on the road network, i.e. excluding the solar plant, was used to estimate the 2018 horizon year background traffic demand illustrated on Figure 7.

4.6 *2018 Horizon Year Total Traffic Demand*

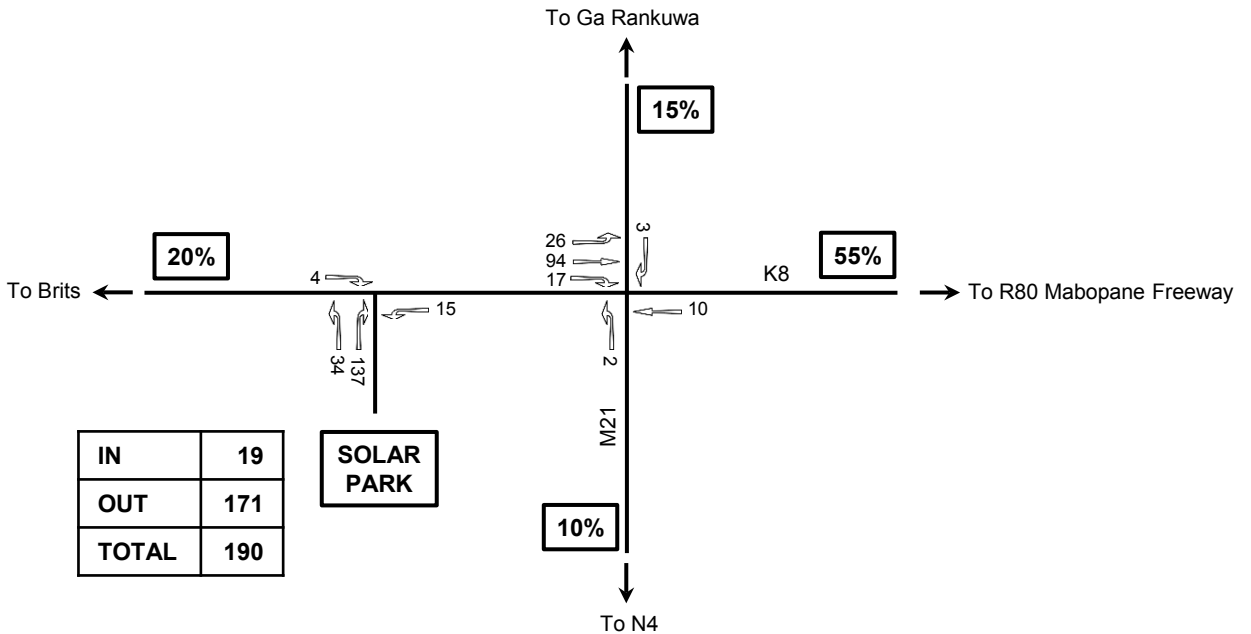
The capacity analysis and assessment of future traffic operational conditions are based on the sum of the 2018 background traffic demand and the peak hour commuter trips generated by the solar plant.

The calculation of the 2018 horizon year total traffic demand is attached in Annexure C and illustrated on Figure 8.

AM PEAK HOUR

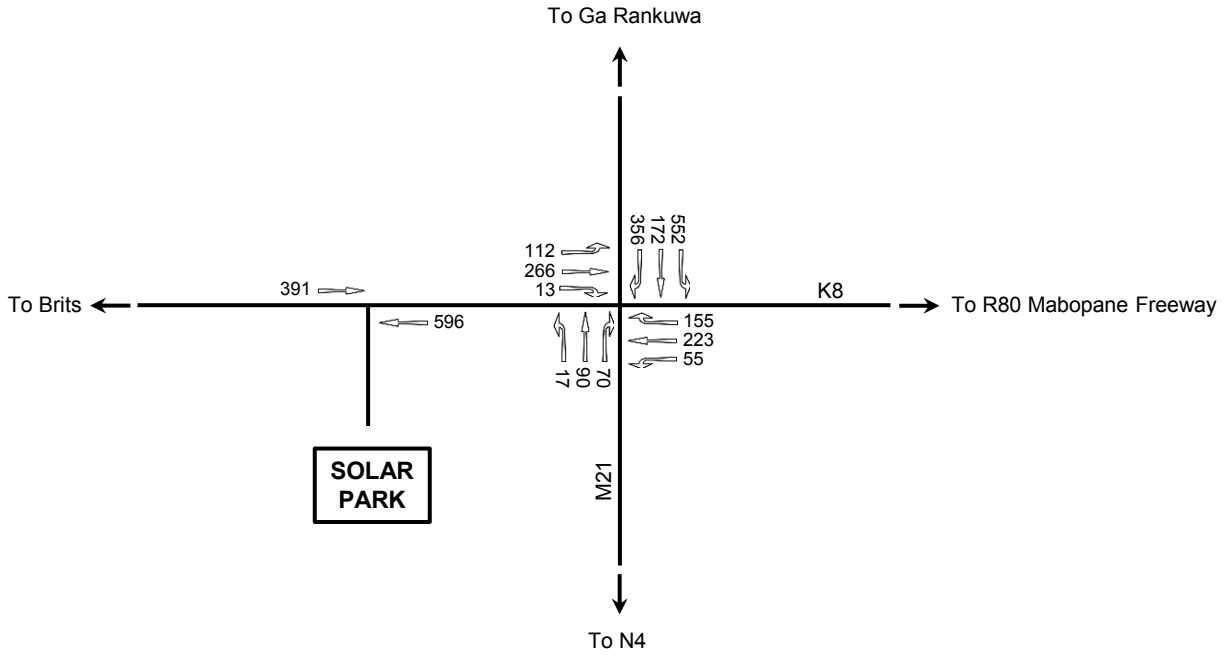


PM PEAK HOUR

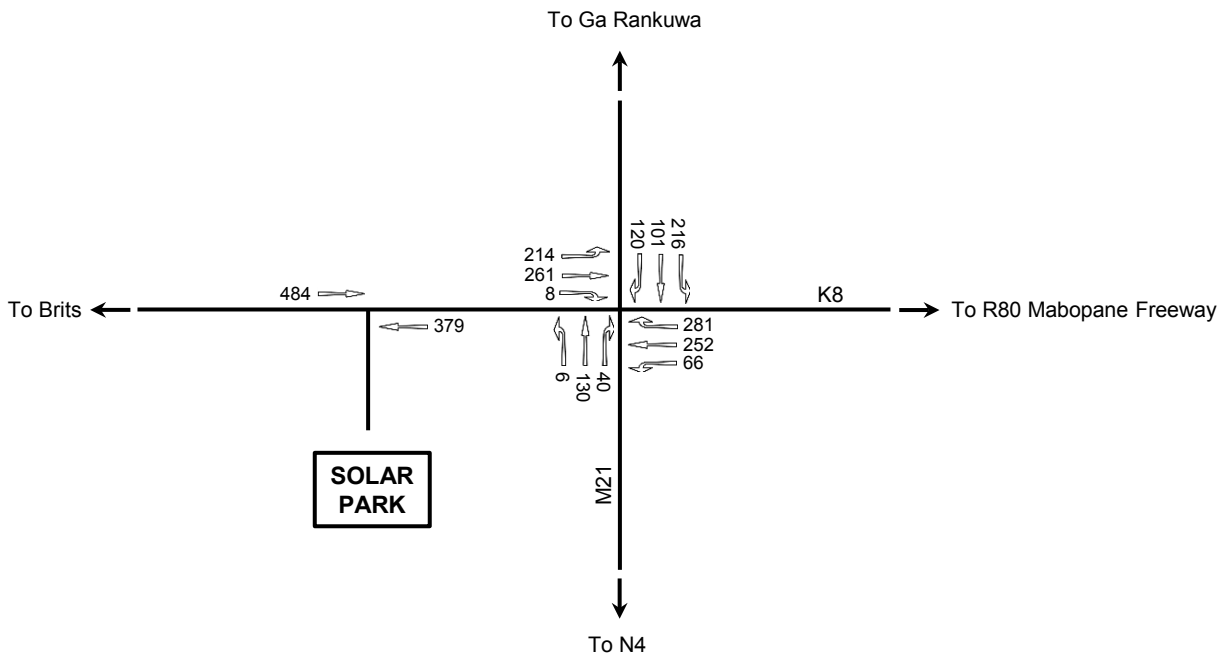


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AM PEAK HOUR



PM PEAK HOUR



NOT TO SCALE

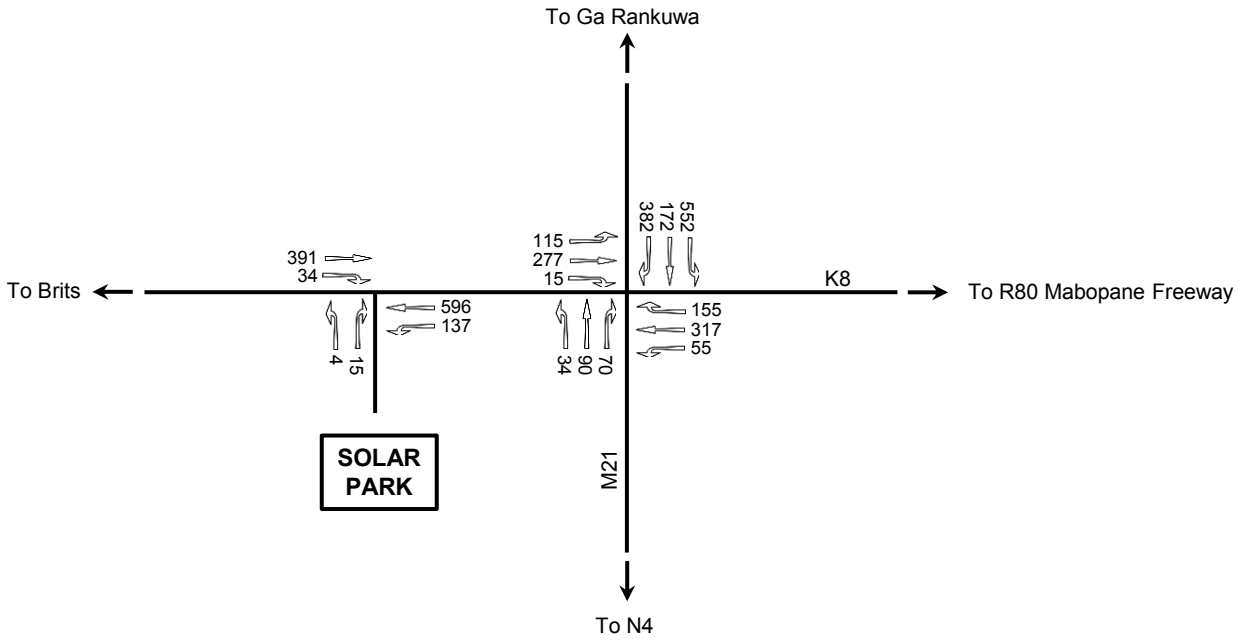
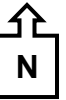


PROPOSED DEWILDT SOLAR PLANT

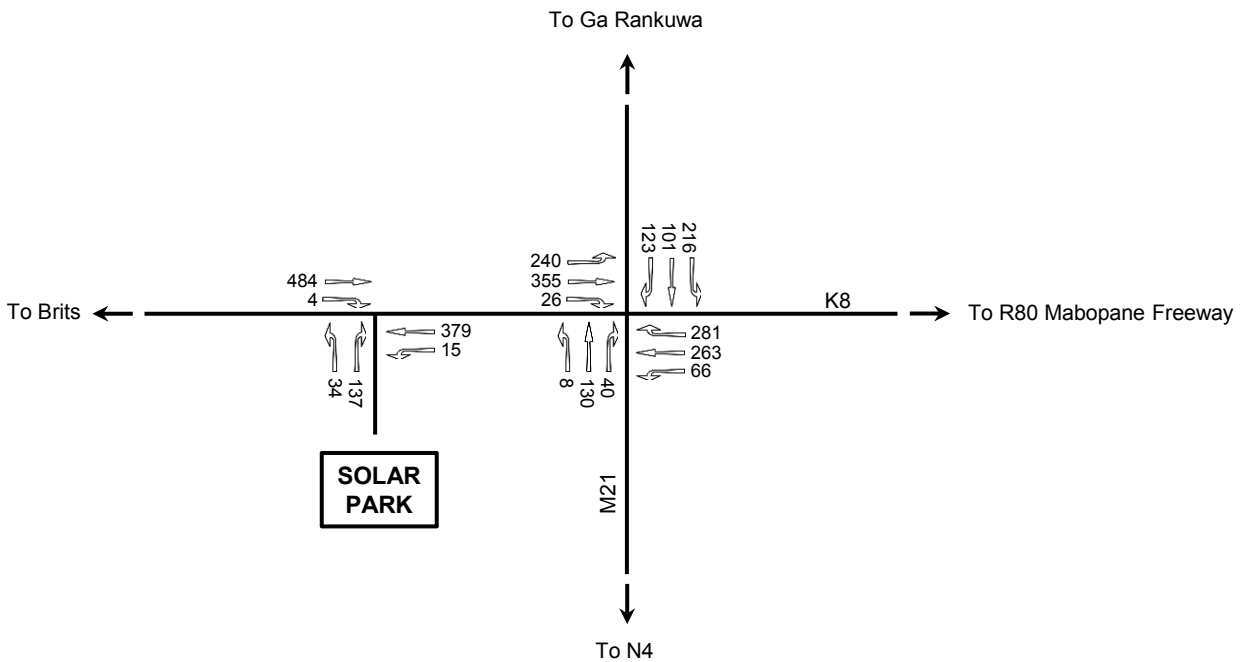
208 Horizon year background traffic

FIGURE 7

AM PEAK HOUR



PM PEAK HOUR



NOT TO SCALE

5. CAPACITY ANALYSIS

5.1 Intersection of M21 and R566

The intersection of M21 and R566 is controlled by four-way stop signs and auxiliary turning lanes have been provided on all intersection approaches.

The intersection geometry is diagrammatically illustrated on Figure 9. An alternative geometry with exclusive right turn lanes and a shared straight and left turn lane per approach was also analysed. The benefits of the alternative layout is that it is suitable for the future installation of traffic signals, the width of the intersection is reduced and the visibility of oncoming straight through vehicles from the right turn lane is also improved. (On coming vehicles are not obscured by the right turn queue).

i. Methodology

The analysis was performed by the SIMTRA microscopic simulation programme and results are attached in Annexure D.

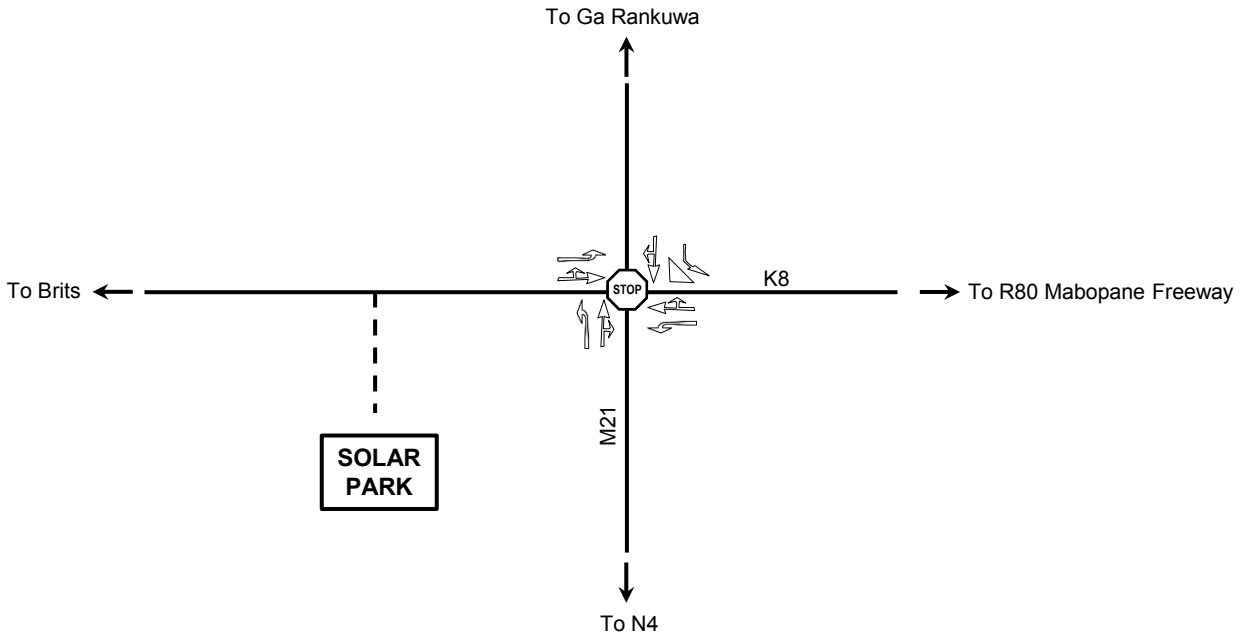
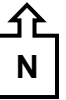
ii. 2018 Background traffic demand

Results of the simulation are summarised in the table below.

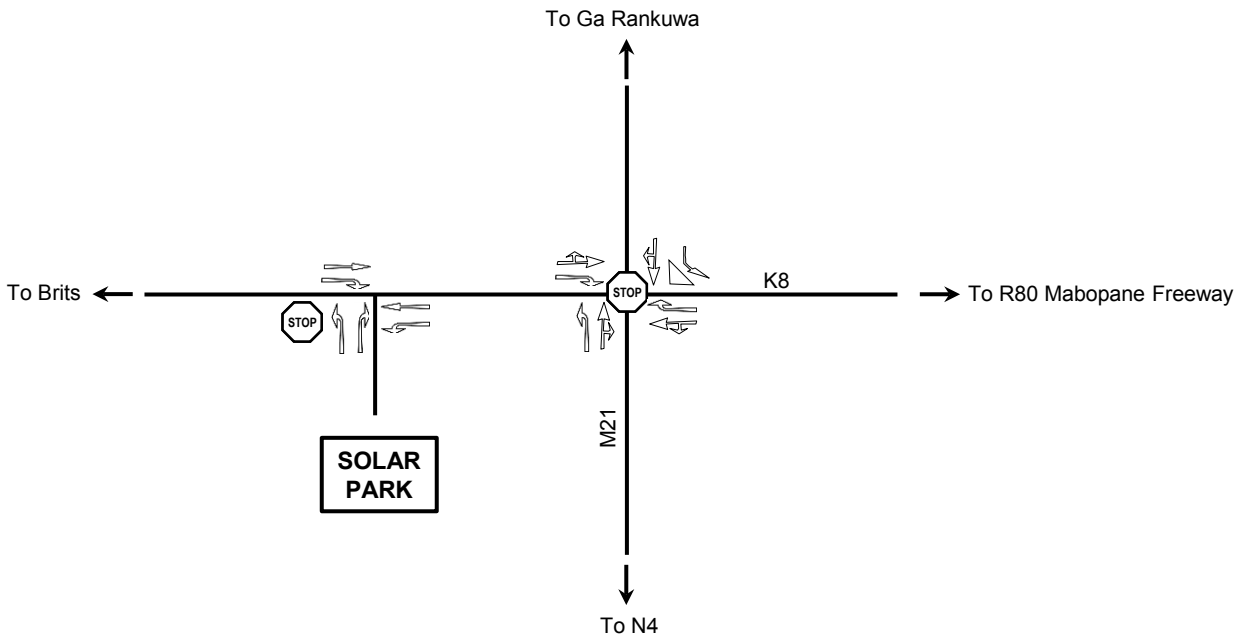
INTERSECTION OF M21 AND R566: 2018 BACKGROUND TRAFFIC DEMAND					
APPROACH	MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		DELAY (s)	LOS	DELAY (s)	LOS
North: M21 (Ga Rankuwa)	Left	9.6	A	7.3	A
	Straight	19.5	C	11.4	B
	Right	19.9	C	12.1	B
	TOTAL	14.6	B	9.7	A
East: R566 (Pretoria)	Left	9.6	A	9.3	A
	Straight	14.6	B	12.9	B
	Right	15.3	C	13.3	B
	TOTAL	14.3	B	12.7	B
South: M21 (N4)	Left	10.7	B	9.7	A
	Straight	13.4	B	11.9	B
	Right	13.5	B	12.1	B
	TOTAL	13.2	B	11.9	B
West: R566 (Brits)	Left	10.1	B	10.2	B
	Straight	14.0	B	11.8	B
	Right	14.0	B	10.5	B
	TOTAL	12.7	B	11.0	B
INTERSECTION		14.1	B	11.4	B

It is concluded that during both the AM and PM peak hours level of service B can be expected for the intersection as a whole. The straight and right turn movements on the northern approach of M21 are expected to experience LOS C.

CURRENT LAYOUT



POSSIBLE ALTERNATIVE LAYOUT



NOT TO SCALE

iii. 2018 Total traffic: Existing intersection layout

Results of the simulation are summarised in the table below.

INTERSECTION OF M21 AND R566: 2018 HORIZON YEAR: CURRENT LANE CONFIGURATION					
APPROACH	MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		DELAY (s)	LOS	DELAY (s)	LOS
North: M21 (Ga Rankuwa)	Left	12.4	B	8.0	A
	Straight	39.6	E	12.8	B
	Right	42.8	E	12.8	B
	TOTAL	27.2	D	10.5	B
East: R566 (Pretoria)	Left	10.0	A	9.6	A
	Straight	24.3	C	15.1	C
	Right	25.7	D	15.9	C
	TOTAL	23.2	C	14.9	B
South: M21 (N4)	Left	11.4	B	10.0	A
	Straight	14.5	B	13.0	B
	Right	15.5	C	13.1	B
	TOTAL	14.3	B	12.9	B
West: R566 (Brits)	Left	10.7	B	10.7	B
	Straight	15.8	C	13.8	B
	Right	15.5	C	13.4	B
	TOTAL	14.1	B	12.6	B
INTERSECTION		22.7	C	12.9	B

It is concluded that the level of service can be expected to decline due to the increased traffic demand generated during the installation of the solar plant.

iv. Intersection of M21 and R566: Alternative layout (exclusive right turn lanes on R566)

Results of the simulation are summarised in the table below.

INTERSECTION OF M21 AND R566: 2018 HORIZON YEAR: ALTERNATIVE LAYOUT (EXCLUSIVE RIGHT TURN LANES ON R566)					
APPROACH	MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		DELAY (s)	LOS	DELAY (s)	LOS
North: M21 (Ga Rankuwa)	Left	10.2	B	8.2	A
	Straight	24.5	C	12.8	B
	Right	25.6	D	12.7	B
	TOTAL	17.8	B	10.5	B
East: R566 (Pretoria)	Left	11.8	B	10.5	B
	Straight	14.9	B	11.3	B
	Right	14.0	B	13.5	B
	TOTAL	14.3	B	12.2	B
South: M21 (N4)	Left	11.1	B	9.3	A
	Straight	13.9	B	13.2	B
	Right	13.8	B	13.2	B
	TOTAL	13.4	B	13.0	B
West: R566 (Brits)	Left	12.4	B	14.7	B
	Straight	15.0	B	15.8	C
	Right	12.8	B	11.2	B
	TOTAL	14.1	B	15.1	C
INTERSECTION		15.9	C	12.9	B

It can be concluded that the alternative lane configuration can be expected to improve traffic operational conditions during the critical AM peak hour. It has negligible impact during the PM peak hour.

v. *Discussion*

Observations during traffic counts that the traffic demand on the northern approach of M21 approaches the capacity of the intersection are confirmed by the results. The increase in traffic demand generated during the installation of the proposed solar plant, fortunately, is relatively low and the background traffic growth expected up to the implementation date is also low.

The capacity analysis therefore confirmed that:

- The AM peak hour is the critical design period
- Traffic conditions during the PM peak are expected to experience a high level of service, with LOS B for the intersection as a whole, as well as the northern, western and southern approach roads, with only the eastern approach where LOS C can be expected
- On average, LOS C is expected during the AM peak hour with LOS D on the northern approach. The straight and right turn movements on the northern approach are expected to experience LOS E
- If the alternative layout is implemented, i.e. exclusive right turn lanes on the R566 eastern and western approaches, the average delay for the intersection during the AM peak hour improves from 22.7 seconds / vehicle to 15.9 seconds / vehicle. (Both fall in the LOS C bracket of 15 seconds < delay ≤ 25 seconds). The level of service on the northern approach improves from LOS D to LOS C and the two critical turning movements, namely straight through and right turn improve from LOS E to LOS C and LOS D respectively.

vi. *Conclusion*

It is concluded that the increase in traffic demand as a result of the proposed DeWildt solar plant can be expected to result in a deterioration of the level of service at the intersection of M21 and R566 during the AM peak hour from LOS B to LOS C, with the straight and right turn movements on the northern approach going from LOS C to LOS E.

In view of the limited duration of the construction, as well as the fact that the poor level of service is only expected during the AM peak hour, the decline in level of service can be considered to be acceptable.

Two options exist to mitigate the impact of the additional AM peak hour traffic, namely:

- Employ points-men during AM peak period
- With a points-man on duty, the traffic operation of vehicles on different approach roads entering the intersection on an alternating basis is replaced by traffic streams being allowed to flow freely through the intersection, while conflicting manoeuvres are stopped. This is a much more efficient method of operation with increased capacity

and shall effectively mitigate the impact of the increase in traffic demand as a result of the proposed solar plant.

- Amend the intersection layout

The lane configuration of the intersection can be amended within the limitation of the existing pavement width. The amended layout will improve traffic operations to an acceptable level of service albeit lower than the situation without the proposed solar plant.

5.2 Access to the site on R566

i. Layout and traffic control

The required intersection layout according to provincial road design standards include exclusive left and right turn lanes on the west- and eastbound approaches of R566 respectively and separate left and right turn lanes at the exit from the site.

Due to the low traffic demand to and from the site, a two-way stop sign is the appropriate method of traffic control.

ii. 2018 Total traffic demand

Results of the simulation are summarised in the table below.

SITE ACCESS ON R566: 2018 HORIZON YEAR TOTAL TRAFFIC DEMAND					
APPROACH	MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		DELAY (s)	LOS	DELAY (s)	LOS
East: R566 (Pretoria)	Left	0.0	A	0.0	A
	Straight	0.1	A	0.1	A
	TOTAL	0.1	A	0.1	A
South: De Wildt Solar Plant	Left	9.2	A	11.3	B
	Right	31.2	D	53.5	F
	TOTAL	26.2	D	46.0	E
West: R566 (Brits)	Straight	0.1	A	0.1	A
	Right	6.0	A	0.9	A
	TOTAL	0.6	A	0.1	A
INTERSECTION		0.7	A	7.5	A

Results of the simulation analysis indicate the following:

- Due to the high two-way traffic demand on R566, right turn egress vehicles from the solar plant can be expected to experience delay during both the AM and PM peaks
- Despite the low egress volume during the AM peak, the right turn traffic stream at the exit is expected to experience LOS D
- The high right turn egress traffic during the PM peak is expected to experience delay of 53.5 seconds (on average), which is in the LOS F bracket.

In view of the low traffic demand during the operational phase of the project, it is recommended that the intersection that provides access to the site should be controlled by a stop sign on the access road and that the layout should provide exclusive turning lanes for all

turning traffic movements. The level of service (LOS F) expected during the PM peak hour is generally considered to be unacceptable and it is recommended to make provision for points-men to assist egress traffic during the PM peak period. Due to the temporary nature of the installation period, no additional improvements are considered to be warranted.

6. PROPOSED ROAD IMPROVEMENTS AND MITIGATION MEASURES

6.1 Intersection of M21 and R566

Based on the capacity analysis it is recommended that points-men should be deployed at the intersection of M21 and R566 during the AM peak period.

It is also possible to amend the intersection layout to provide an exclusive right turn lane plus shared straight and left turn lane in both directions on the R566 to increase the capacity of the intersection and improve the level of service, but it is not considered to be justified at this point in time.

Traffic counting staff reported that vehicles on R566 do not adhere to road traffic signs and do not stop at the four-way stop at the intersection of M21 and R566. It is therefore recommended that the Environmental Management Plan should provide for improved traffic law enforcement at this intersection during both the AM and PM peak periods (06:30-08:00 and 16:00-17:30).

6.2 Access to the Site

The **position** of the access must be agreed with the North West Provincial Department of Public Works and Roads.

The access must be designed to provide for the following:

- i. The design vehicle for the intersection shall be a 25-metre articulated truck or interlink. The layout must also be able to accommodate abnormal load vehicles for the delivery of very heavy electrical equipment.
- ii. The intersection shall also be able to provide access to the land to the north of R566 in future. Implementation of the northern leg is not required as long as the land use and zoning remain unchanged.
- iii. The installation of protected right turn lanes has proven world-wide to reduce accident rates and should be included in the design of the western approach of R566.
- iv. A left turn deceleration lane should be provided on the eastern approach of R566 to reduce the speed differential between left turning traffic that wishes to enter the site and fast-moving through traffic on R566, which is a high speed mobility road.
- v. Separate left and right turn lane on the side road to allow left turn traffic to proceed when an acceptable gap is available in the westbound traffic stream on the R566, while right turn egress traffic has to wait for a gap in both the traffic streams on R566.

It should be noted that the above requirements apply to major provincial rural roads. The standards are particularly appropriate because the R566 carries high volumes of traffic, including heavy trucks, during peak periods.

6.3 Access Position

TRH 26, *South African Road Classification and Access Management Manual*, Version 1, August 2012 recently approved by the Road Co-ordinating Body (RCB) of the Committee of Transport Officials (COTO), as well as the standards applied by provincial departments responsible for roads, requires a long minimum spacing on major arterial roads. R566 has been designated as route K8 in both Gauteng Province and North West Province and a minimum intersection spacing of 600 metres applies. A further requirement is that an intersection may not occur on a curve where the sight distance of drivers on the side road is reduced to less than 300 metres.

The position of the access indicated on the layout plan would be acceptable from a sight distance point of view, but access to the property to the west may not be possible if the minimum spacing is applied, due to the long horizontal curve on the R566 west of the site. This matter is currently being investigated and has been referred to the North West Provincial Department of Public Works and Roads.

The access position could be moved 100m to the east to a position close to the overhead powerline. At the relocated position, sufficient sight distance would be available while sight distance at an access position 600m to the west will be improved.

The access position to the west can also be used to provide access to the portion of the application property to the west of the watercourse that runs through the property in a north-south orientation without the need for a water use licence to cross the watercourse. The possible relocation of the access is illustrated on Figure 10.

6.4 Throat Length

Throat length refers to the distance between a road and the first intersection on an intersecting road. A throat length requirement of 100 metres applies to Class 2 major arterial roads such as the R566 (K8). This distance is sufficient to accommodate traffic queues at the entrance gate, as well as at the stop street at the R566 (egress traffic).

6.5 Access Control

Two entrance gates will be required, namely one for employees who have been issued with access control devices and a separate access for visitors, deliveries or other traffic where permission to enter the property has to be confirmed.

One exit gate is required for vehicles that are allowed to leave the site without a security check, plus an additional gate for vehicles that have to undergo a security check at the exit.

6.6 Deliveries and Security Control

An area of sufficient size must be reserved at the access where delivery vehicles can park, while they have to wait to enter the site during the implementation phase. The 100 metre throat length will provide adequate space between the R566 and the access, but this area should be widened to create a parking area for trucks during the construction phase. During the operational phase traffic can queue in the 100m between the access control gate and the R566.



NOT TO SCALE

7. CONCLUSIONS AND RECOMMENDATIONS

Based on information provided by the Environmental Practitioner, a site visit, traffic counts, traffic demand analysis and capacity analysis, perusal of the major road network planning of both Gauteng and North West provinces and discussions with officials of the North West Provincial Department of Public Works and Roads, it is concluded that:

- i. The proposed access position to the site on R566 should be confirmed with the North West Provincial Department of Public Works and Roads to ensure that safe access can be provided to the solar plant site, as well as the adjacent properties to the west of the site and the portion of the site west of the watercourse that divides the site into a western and eastern portion.
- ii. High two-way traffic is experienced on route R566 during peak periods.
- iii. High conflicting traffic volumes are experienced at the intersection of route M21 to Ga Rankuwa and R566.
- iv. Significant traffic demand will be generated during the installation of the solar plant, but traffic demand during operations is expected to be very low. Traffic will include heavy trucks, as well as minibus taxis and buses.
- v. Although the capacity of the access on R566 and the intersection of M21 and R566 is not expected to be exceeded, long delays and a poor level of service can be expected during peak hours.
- vi. Due to the limited duration of the construction period, it is not considered justified to upgrade the roads to achieve levels of service that are generally required, but points-men on duty would be able to assist traffic movements that experience unacceptable delay (level of service).
- vii. It will be necessary to upgrade the access to the site to comply with geometric requirements of the North West Provincial Department of Public Works and Roads.
- viii. An option exists to amend the layout of the intersection of M21 and R566 to increase the capacity without extensive construction works.
- ix. The design of the access on the R566 and the access control to the site must take the expected vehicle types and the security arrangements at the entrance gate into account.

It is recommended from a Traffic Engineering point of view that:

- i. The proposed DeWildt 50 MW PV solar plant development be authorised, including the construction of a new access to the site.
- ii. Approval must be obtained from the North West Provincial Department of Public Works and Roads for the proposed access to the site.

- iii. Provision should be made in the Environmental Management Plan to employ points-men to regulate traffic at the intersection of M21 and R566 during the AM peak period and at the access to the site during the PM peak period, should this prove to be required.
- iv. The design of the access to the site on the R566 must be submitted to the North West Provincial Department of Public Works and Roads for approval and must take all expected vehicle types, including public transport vehicles, delivery vehicles and abnormal trucks for its delivery of heavy plant and equipment into account.
- v. Special care must be given to the design of access control and storage areas at the entrance to the site to avoid any impact on traffic operations on the R566.
- vi. Arrangements must be made for transportation of employees to and from the site.
- vii. Law enforcement authorities should be requested to implement improved visual policing and law enforcement to eliminate the violation of traffic signs at the intersection of M21 and R566.

ANNEXURE A

Photographic record



Southern ramp terminal M17 / N4 interchange



R566 / M17 intersection northward view



Access to new residential development on R566
(east of site)



Access to church



M21 / R566 intersection eastern approach



T-junction provides access to shopping centre
and filling station



Private road to properties north of R566



Northern approach of private road access on R566



Westward view from southern approach opposite private road



View westward



Truck on R566 (eastbound at overhead powerline crossing)



Eland Platinum mine access

ANNEXURE B

Traffic counts

Traffic Support Services

Quality manual counting



Customer:TECH IQ

Intersection: M21 / R566

Date:18 APRIL 2016

Light vehicles

TIME		TRAFFIC MOVEMENTS												TOTAL
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	
06:00	06:15	3	12	5	7	41	22	97	27	46	11	41	1	313
06:15	06:30	1	10	13	12	36	17	139	23	73	12	54	1	391
06:30	06:45	8	18	16	8	56	36	117	39	64	23	74	2	461
06:45	07:00	3	24	18	14	41	34	117	51	68	27	48	4	449
07:00	07:15	3	22	16	15	59	46	114	38	93	29	48	4	487
07:15	07:30	1	34	19	13	52	29	56	31	56	15	35	2	343
07:30	07:45	6	33	18	8	46	26	38	25	50	23	39	2	314
07:45	08:00	2	21	10	3	43	24	40	17	32	26	24	1	243
08:00	08:15	0	16	8	5	41	32	33	21	38	7	31	0	232
08:15	08:30	3	20	10	7	32	24	27	13	25	9	21	1	192
08:30	08:45	0	13	6	4	31	13	13	12	10	9	23	1	135
08:45	09:00	2	11	4	1	26	13	25	11	21	12	21	0	147
09:00	09:15	2	10	4	6	37	22	22	13	19	10	26	0	171
09:15	09:30	2	9	5	2	33	17	24	18	21	10	17	1	159
09:30	09:45	4	12	6	6	24	15	33	14	13	13	25	0	165
09:45	10:00	3	13	1	5	21	21	31	17	10	12	28	0	162
10:00	10:15	0	14	5	4	25	13	22	15	14	21	24	0	157
10:15	10:30	3	12	6	6	26	17	20	7	14	13	32	3	159
10:30	10:45	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	11:00	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	11:15	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	11:30	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	11:45	2	10	3	2	34	20	21	6	18	13	31	1	161
11:45	12:00	2	15	2	5	26	23	31	16	13	11	17	3	164
12:00	12:15	1	14	1	3	28	21	22	15	17	17	20	2	161
12:15	12:30	1	17	2	2	24	24	21	13	26	17	33	0	180
12:30	12:45	1	16	1	6	38	20	25	7	18	9	29	0	170
12:45	13:00	1	7	5	4	28	12	37	14	24	14	26	1	173
13:00	13:15	0	8	5	5	21	19	23	12	19	18	33	1	164
13:15	13:30	2	9	7	2	23	9	23	8	8	20	26	1	138
13:30	13:45	1	13	4	10	30	10	34	13	19	16	26	0	176
13:45	14:00	1	15	4	5	23	22	20	9	21	19	20	3	162
14:00	14:15	3	18	5	1	19	7	25	13	17	16	23	0	147
14:15	14:30	2	8	3	3	23	23	17	14	14	21	48	0	176
14:30	14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	15:15	2	18	3	7	19	27	26	13	6	24	30	0	175
15:15	15:30	1	14	3	5	28	28	20	3	13	32	41	3	191
15:30	15:45	3	14	4	8	36	34	31	14	26	33	45	2	250
15:45	16:00	0	24	9	6	23	23	23	12	13	32	33	3	201
16:00	16:15	5	23	4	13	25	38	35	21	25	36	52	0	277
16:15	16:30	3	15	3	11	62	64	37	30	30	55	62	2	374
16:30	16:45	0	31	9	7	38	60	36	23	24	36	44	1	309
16:45	17:00	2	34	4	15	59	59	64	15	19	39	62	1	373
17:00	17:15	1	34	13	13	50	68	39	17	28	55	49	2	369
17:15	17:30	5	37	9	14	59	58	51	21	24	37	44	1	360
17:30	17:45	3	25	4	11	39	55	29	20	12	39	37	1	275
17:45	18:00	3	22	3	8	37	52	29	17	11	44	42	1	269
TOTAL		91	745	280	292	1462	1197	1687	738	1112	935	1484	52	10075

Traffic Support Services

Quality manual counting



Customer: TECH IQ

Intersection: M21 / R566

Date: 18 APRIL 2016

Taxis

TIME		TRAFFIC MOVEMENTS												TOTAL
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	
06:00	06:15	0	0	0	0	2	2	15	2	1	3	5	0	30
06:15	06:30	0	1	0	0	4	1	7	2	6	4	6	0	31
06:30	06:45	0	1	0	0	0	1	10	2	8	1	3	0	26
06:45	07:00	0	0	0	1	2	3	8	2	12	2	5	0	35
07:00	07:15	0	5	1	1	2	0	4	1	7	4	1	0	26
07:15	07:30	0	0	0	1	1	3	1	1	2	2	1	0	12
07:30	07:45	0	1	0	0	2	2	3	1	4	1	0	0	14
07:45	08:00	0	0	0	0	1	4	2	1	1	2	0	0	11
08:00	08:15	0	2	0	0	0	3	3	0	3	5	1	0	17
08:15	08:30	0	0	1	0	0	2	0	0	2	1	0	0	6
08:30	08:45	0	1	0	0	0	4	5	1	2	4	0	0	17
08:45	09:00	0	0	0	0	0	3	4	1	1	4	1	0	14
09:00	09:15	0	0	0	0	1	3	2	0	2	1	0	0	9
09:15	09:30	0	0	0	0	2	4	3	1	1	1	0	0	12
09:30	09:45	0	0	0	0	1	0	0	1	0	1	0	0	3
09:45	10:00	0	2	0	0	0	1	4	0	1	1	0	0	9
10:00	10:15	0	2	0	0	0	1	0	0	2	1	0	0	6
10:15	10:30	0	0	0	0	1	1	3	1	2	0	0	0	8
10:30	10:45	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	11:00	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	11:15	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	11:30	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	1	3	1	1	0	0	6
11:45	12:00	0	1	0	0	0	1	1	1	1	1	0	0	6
12:00	12:15	0	1	0	0	2	0	0	0	0	0	0	1	4
12:15	12:30	0	0	1	0	0	1	2	0	2	0	0	0	6
12:30	12:45	0	0	0	0	0	1	1	1	0	3	0	0	6
12:45	13:00	0	0	0	0	0	0	2	0	0	0	2	0	4
13:00	13:15	0	0	0	0	0	0	0	1	2	1	1	0	5
13:15	13:30	0	0	0	0	0	1	1	1	0	2	0	0	5
13:30	13:45	0	1	0	0	0	1	0	1	0	0	0	0	3
13:45	14:00	0	0	0	0	2	0	1	0	1	1	0	0	5
14:00	14:15	0	0	0	0	0	0	3	1	1	1	1	0	7
14:15	14:30	1	0	0	0	0	0	0	-1	0	1	0	0	1
14:30	14:45	0	0	0	0	0	0	0	1	0	0	0	0	1
14:45	15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	15:15	0	1	0	0	1	1	4	0	1	9	2	0	19
15:15	15:30	0	0	0	1	0	1	2	0	0	2	0	0	6
15:30	15:45	0	1	0	0	0	3	4	2	1	3	0	0	14
15:45	16:00	0	1	0	0	1	2	3	1	1	2	1	0	12
16:00	16:15	0	1	0	0	1	3	2	1	3	3	0	0	14
16:15	16:30	0	1	0	0	1	1	5	1	1	3	1	0	14
16:30	16:45	0	0	0	0	5	1	4	1	2	1	0	0	14
16:45	17:00	0	2	0	0	0	1	5	0	2	2	1	0	13
17:00	17:15	0	2	1	0	2	2	3	1	1	4	0	1	17
17:15	17:30	0	2	0	0	3	3	3	2	2	2	0	0	17
17:30	17:45	0	2	0	0	3	4	1	4	2	4	0	0	20
17:45	18:00	0	1	0	0	2	3	2	3	2	2	2	0	17
TOTAL		1	32	4	4	42	68	124	42	83	86	34	2	522

Traffic Support Services

Quality manual counting



Customer: TECH IQ
Intersection: M21 / R566
Date: 18 APRIL 2016

Heavy Vehicles

TIME		TRAFFIC MOVEMENTS												TOTAL
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	
06:00	06:15	0	1	1	0	3	1	2	2	1	0	1	0	12
06:15	06:30	0	1	0	0	1	1	0	1	2	0	3	0	9
06:30	06:45	0	2	0	1	3	2	1	0	2	2	3	0	16
06:45	07:00	1	0	1	0	5	2	2	3	1	2	2	0	19
07:00	07:15	0	1	1	0	1	3	1	0	0	0	4	1	12
07:15	07:30	0	3	0	0	5	4	1	1	2	0	1	1	18
07:30	07:45	0	1	0	1	4	1	1	2	6	0	4	0	20
07:45	08:00	2	0	2	1	7	8	1	1	1	1	8	0	32
08:00	08:15	0	3	2	3	8	6	2	0	3	0	4	0	31
08:15	08:30	0	1	1	0	5	0	1	1	0	2	10	0	21
08:30	08:45	0	0	1	1	7	6	3	1	4	5	11	1	40
08:45	09:00	1	0	4	2	6	4	3	1	2	1	20	0	44
09:00	09:15	0	2	2	4	9	5	0	2	3	1	5	0	33
09:15	09:30	0	2	1	4	11	3	2	0	2	0	4	0	29
09:30	09:45	0	3	1	0	11	1	1	1	0	0	5	1	24
09:45	10:00	0	3	1	0	5	6	3	2	1	1	8	1	31
10:00	10:15	0	1	3	2	9	0	4	1	0	2	13	0	35
10:15	10:30	0	0	1	0	13	4	3	1	2	2	10	0	36
10:30	10:45	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	11:00	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	11:15	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	11:30	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	11:45	0	3	1	4	6	4	3	2	2	3	10	0	38
11:45	12:00	0	2	2	1	5	1	1	1	1	0	3	0	17
12:00	12:15	1	0	1	0	10	7	12	1	1	0	13	0	46
12:15	12:30	0	1	1	1	8	1	2	2	2	1	13	0	32
12:30	12:45	0	2	2	1	9	6	1	3	0	0	6	0	30
12:45	13:00	0	1	1	0	4	4	2	0	1	2	11	0	26
13:00	13:15	0	4	1	2	7	4	5	4	1	1	6	0	35
13:15	13:30	0	4	0	2	10	1	3	3	0	4	13	0	40
13:30	13:45	0	0	0	2	7	3	5	3	1	0	4	0	25
13:45	14:00	0	1	0	1	5	1	3	2	5	0	8	0	26
14:00	14:15	1	1	2	0	12	6	6	0	3	0	4	0	35
14:15	14:30	0	3	1	1	4	0	4	3	0	1	10	0	27
14:30	14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	15:15	0	1	2	2	10	3	4	0	1	2	9	0	34
15:15	15:30	0	2	4	1	6	4	5	1	2	2	8	0	35
15:30	15:45	0	2	2	2	8	2	4	2	1	1	7	0	31
15:45	16:00	0	2	0	2	6	1	3	0	0	1	6	1	22
16:00	16:15	0	2	0	2	3	4	3	1	1	0	8	0	24
16:15	16:30	0	0	3	5	9	1	4	2	1	5	8	0	38
16:30	16:45	0	3	1	1	1	3	1	0	1	0	4	0	15
16:45	17:00	0	1	1	1	7	3	1	1	3	2	5	0	25
17:00	17:15	0	0	3	9	4	2	5	4	1	0	10	1	39
17:15	17:30	0	2	2	1	9	4	2	1	0	1	4	1	27
17:30	17:45	1	1	2	0	4	0	0	2	0	1	6	0	17
17:45	18:00	0	0	3	1	2	0	2	1	0	2	3	1	15
TOTAL		7	62	57	61	269	122	112	59	60	48	295	9	1161

Traffic Support Services

Quality manual counting



Customer: TECH IQ
Intersection: M21 / R566
Date: 18 APRIL 2016

ALL VEHICLES

TIME		MOVEMENT NUMBER												TOTAL
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	
06:00	06:15	3	13	6	7	46	25	114	31	48	14	47	1	355
06:15	06:30	1	12	13	12	41	19	146	26	81	16	63	1	431
06:30	06:45	8	21	16	9	59	39	128	41	74	26	80	2	503
06:45	07:00	4	24	19	15	48	39	127	56	81	31	55	4	503
07:00	07:15	3	28	18	16	62	49	119	39	100	33	53	5	525
07:15	07:30	1	37	19	14	58	36	58	33	60	17	37	3	373
07:30	07:45	6	35	18	9	52	29	42	28	60	24	43	2	348
07:45	08:00	4	21	12	4	51	36	43	19	34	29	32	1	286
08:00	08:15	0	21	10	8	49	41	38	21	44	12	36	0	280
08:15	08:30	3	21	12	7	37	26	28	14	27	12	31	1	219
08:30	08:45	0	14	7	5	38	23	21	14	16	18	34	2	192
08:45	09:00	3	11	8	3	32	20	32	13	24	17	42	0	205
09:00	09:15	2	12	6	10	47	30	24	15	24	12	31	0	213
09:15	09:30	2	11	6	6	46	24	29	19	24	11	21	1	200
09:30	09:45	4	15	7	6	36	16	34	16	13	14	30	1	192
09:45	10:00	3	18	2	5	26	28	38	19	12	14	36	1	202
10:00	10:15	0	17	8	6	34	14	26	16	16	24	37	0	198
10:15	10:30	3	12	7	6	40	22	26	9	18	15	42	3	203
10:30	10:45	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	11:00	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	11:15	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	11:30	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	11:45	2	13	4	6	40	24	25	11	21	17	41	1	205
11:45	12:00	2	18	4	6	31	25	33	18	15	12	20	3	187
12:00	12:15	2	15	2	3	40	28	34	16	18	17	33	3	211
12:15	12:30	1	18	4	3	32	26	25	15	30	18	46	0	218
12:30	12:45	1	18	3	7	47	27	27	11	18	12	35	0	206
12:45	13:00	1	8	6	4	32	16	41	14	25	16	39	1	203
13:00	13:15	0	12	6	7	28	23	28	17	22	20	40	1	204
13:15	13:30	2	13	7	4	33	11	27	12	8	26	39	1	183
13:30	13:45	1	14	4	12	37	14	39	17	20	16	30	0	204
13:45	14:00	1	16	4	6	30	23	24	11	27	20	28	3	193
14:00	14:15	4	19	7	1	31	13	34	14	21	17	28	0	189
14:15	14:30	3	11	4	4	27	23	21	16	14	23	58	0	204
14:30	14:45	0	0	0	0	0	0	0	1	0	0	0	0	1
14:45	15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	15:15	2	20	5	9	30	31	34	13	8	35	41	0	228
15:15	15:30	1	16	7	7	34	33	27	4	15	36	49	3	232
15:30	15:45	3	17	6	10	44	39	39	18	28	37	52	2	295
15:45	16:00	0	27	9	8	30	26	29	13	14	35	40	4	235
16:00	16:15	5	26	4	15	29	45	40	23	29	39	60	0	315
16:15	16:30	3	16	6	16	72	66	46	33	32	63	71	2	426
16:30	16:45	0	34	10	8	44	64	41	24	27	37	48	1	338
16:45	17:00	2	37	5	16	66	63	70	16	24	43	68	1	411
17:00	17:15	1	36	17	22	56	72	47	22	30	59	59	4	425
17:15	17:30	5	41	11	15	71	65	56	24	26	40	48	2	404
17:30	17:45	4	28	6	11	46	59	30	26	14	44	43	1	312
17:45	18:00	3	23	6	9	41	55	33	21	13	48	47	2	301
TOTAL		99	839	341	357	1773	1387	1923	839	1255	1069	1813	63	11758

ANNEXURE C

Calculations

ANNEXURE C. INTERSECTION OF M21 AND R566: TRAFFIC DEMAND CALCULATION

PERIOD	INTERSECTION	APPROACH	TURN	Count 2016	2018 BG	ASSIGNMENT			TOTAL TRAFFIC	
						%In	%Out	Trips		
AM PEAK HOUR	M21 / R566	South M21	Left	16	17	10		17	34	
			Straight	85	90			0	90	
			Right	66	70			0	70	
		East R566	Left	52	55			0	55	
			Straight	210	223	55		94	317	
			Right	146	155			0	155	
		North M23	Left	520	552			0	552	
			Straight	162	172			0	172	
			Right	336	356	15		26	382	
		West R566	Left	106	112			15	3	115
			Straight	251	266			55	10	277
			Right	12	13			10	2	15
	ACCESS R566	South Solar Park	Left	0	0		20	4	4	
			Right	0	0		80	15	15	
		East R566	Left	0	0	80		137	137	
			Straight	562	596			0	596	
		West R566	Straight	369	391			0	391	
			Right	0	0	20		34	34	
	TRIP GENERATION						171	19		
	PM PEAK HOUR	M21 / R566	South M22	Left	6	6	10		2	8
Straight				123	130			0	130	
Right				38	40			0	40	
East R567			Left	62	66			0	66	
			Straight	238	252	55		10	263	
			Right	265	281			0	281	
North M24			Left	204	216			0	216	
			Straight	95	101			0	101	
			Right	113	120	15		3	123	
West M22			Left	202	214			15	26	240
			Straight	246	261			55	94	355
			Right	8	8			10	17	26
ACCESS R566		South Solar Park	Left	0	0		20	34	34	
			Right	0	0		80	137	137	
		East R566	Left	0	0	80		15	15	
			Straight	357	379			0	379	
	West R566	Straight	456	484			0	484		
		Right	0	0	20		4	4		
TRIP GENERATION						19	171			

ANNEXURE D

SIMTRA results

```

@-----
@ <<< DEWILDT 50 MW PV SOLAR PARK >>>
@-----
@ NETW SIM VEH DELAY GEO-DEL UNIT-RATES START AMBER-GREEN PLAT FLOW
@CYCLE TIME SPAC /STOP STOP YLD DEL STOP LTIME LT ST RT FACT FACT
      120          9  9  6  1.00 25.00      2  3  3  5      1.00
@SIMTRA PARAMETERS (NOT REQUIRED BY SIMNET) -----
@PRIORITY CONTROL          FROM LEFT          FROM OPPOSITE          FROM RIGHT
@CAPACITY FACTORS      LT      ST      RT      LT      ST      RT      LT      ST      RT
*2-WAY AVERAGE      9.999  6.300  5.200  9.999  9.999  4.700  5.400  6.800  5.700
*2-WAY STD.DEV      9.999  2.600  3.100  9.999  9.999  1.100  2.600  2.200  2.900
*MINI-CIRCLE A      9.999  9.999  9.999  3.200  3.500  3.800  3.000  3.500  4.000
*MINI-CIRCLE S      9.999  9.999  9.999  1.900  2.000  2.100  1.900  2.000  2.100
*4-WAY AVERAGE      2.000  2.600  3.000  1.500  2.600  2.500  2.900  2.700  2.500
*4-WAY STD.DEV      .000   .000   .000   .000   .000   .000   .000   .000   .000
@SIMNET PARAMETERS (NOT REQUIRED BY SIMTRA) -----
@PRIORITY CONTROL          FROM LEFT          FROM OPPOSITE          FROM RIGHT
@CAPACITY FACTORS      LT      ST      RT      LT      ST      RT      LT      ST      RT
#2-WAY AVERAGE      9.999  6.300  5.200  9.999  9.999  4.700  5.400  6.800  5.700
#2-WAY STD.DEV      9.999  2.600  3.100  9.999  9.999  1.100  2.600  2.200  2.900
#4-WAY AVERAGE      0.680  0.660  0.630  0.690  0.660  0.670  0.640  0.650  0.670
#4-WAY STD.DEV      0.220  0.200  0.180  0.250  0.200  0.200  0.190  0.200  0.200
@-----
@LT,ST,RT RECOMMENDED SATURATION FLOWS
@ 1800,1800,1600 SIGNALS (1800 PROTECTED RIGHT TURN)
@ 1600,1600,1600 STOP/YIELD CONTROL
@ 1600,1600,1400 FOR LT,ST,RT AND MINI CIRCLES
@-----

```


@-----
 @ R566 / M21 INTERSECTION AT GA-RANKUWA (2018). 4-WAY STOP: AM PEAK HOUR
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0001

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 20 1001000 0000001 YSS 0 1.00 25.00
 E 12 1001000 0000001 SSS 0 1.00 25.00
 S 12 1001000 0000001 SSS 0 1.00 25.00
 W 12 1001000 0000001 SSS 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR
 N 552 172 382 1800 1800 1800 2 3 3 5
 E 55 317 155 1800 1800 1800 2 3 3 5
 S 34 90 70 1800 1800 1800 2 3 3 5
 W 115 277 15 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * N * L * 1089 * 12.4 * 88.4 * 34.49 *
 * N * S * 331 * 39.6 * 99.8 * 64.57 *
 * N * R * 766 * 42.8 * 100.0 * 67.80 *
 * N * ***** 2186 * 27.2 * 94.2 * 50.72 *
 * E * L * 112 * 10.0 * 99.8 * 34.94 *
 * E * S * 615 * 24.3 * 100.0 * 49.25 *
 * E * R * 339 * 25.7 * 100.0 * 50.72 *
 * E * ***** 1066 * 23.2 * 100.0 * 48.21 *
 * S * L * 65 * 11.4 * 100.0 * 36.41 *
 * S * S * 185 * 14.5 * 100.0 * 39.53 *
 * S * R * 142 * 15.5 * 100.0 * 40.45 *
 * S * ***** 392 * 14.3 * 100.0 * 39.35 *
 * W * L * 264 * 10.7 * 100.0 * 35.75 *
 * W * S * 530 * 15.8 * 100.0 * 40.76 *
 * W * R * 30 * 15.5 * 100.0 * 40.46 *
 * W * ***** 824 * 14.1 * 100.0 * 39.14 *
 ***** 4468 * 22.7 * 97.1 * 46.99 *

@-----
 @ R566 / M21 INTERSECTION AT GA-RANKUWA (2018). 4-WAY STOP: PM PEAK HOUR
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0001

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 20 1001000 0000001 YSS 0 1.00 25.00
 E 12 1001000 0000001 SSS 0 1.00 25.00
 S 12 1001000 0000001 SSS 0 1.00 25.00
 W 12 1001000 0000001 SSS 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR
 N 216 101 146 1800 1800 1800 2 3 3 5
 E 66 347 281 1800 1800 1800 2 3 3 5
 S 8 130 40 1800 1800 1800 2 3 3 5
 W 217 271 10 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * N * L * 420 * 7.5 * 78.8 * 27.23 *
 * N * S * 182 * 12.2 * 99.7 * 37.15 *
 * N * R * 312 * 12.8 * 100.0 * 37.82 *
 * N * ***** 914 * 10.3 * 90.2 * 32.82 *
 * E * L * 146 * 9.3 * 99.9 * 34.28 *
 * E * S * 703 * 15.7 * 100.0 * 40.69 *
 * E * R * 566 * 15.3 * 100.0 * 40.34 *
 * E * ***** 1415 * 14.9 * 100.0 * 39.89 *
 * S * L * 16 * 10.2 * 100.0 * 35.19 *
 * S * S * 254 * 12.3 * 100.0 * 37.25 *
 * S * R * 80 * 12.6 * 100.0 * 37.58 *
 * S * ***** 350 * 12.2 * 100.0 * 37.23 *
 * W * L * 431 * 10.4 * 100.0 * 35.44 *
 * W * S * 531 * 12.1 * 100.0 * 37.08 *
 * W * R * 25 * 12.5 * 100.0 * 37.48 *
 * W * ***** 987 * 11.4 * 100.0 * 36.38 *
 ***** 3666 * 12.5 * 97.5 * 36.93 *

@-----
 @ R566 / M21 INTERSECTION AT GA-RANKUWA (2018). 4-WAY STOP: AM UPGRADE
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0001

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 20 1001000 0000001 YSS 0 1.00 25.00
 E 12 0100100 0000001 SSS 0 1.00 25.00
 S 12 1001000 0000001 SSS 0 1.00 25.00
 W 12 0100100 0000001 SSS 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR
 N 552 172 382 1800 1800 1800 2 3 3 5
 E 55 317 155 1800 1800 1800 2 3 3 5
 S 34 90 70 1800 1800 1800 2 3 3 5
 W 115 277 15 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * N * L * 1083 * 10.2 * 85.6 * 31.57 *
 * N * S * 333 * 24.5 * 99.8 * 49.44 *
 * N * R * 772 * 25.6 * 100.0 * 50.65 *
 * N * ***** 2188 * 17.8 * 92.9 * 41.02 *
 * E * L * 112 * 11.8 * 99.8 * 36.76 *
 * E * S * 614 * 14.9 * 100.0 * 39.88 *
 * E * R * 339 * 14.0 * 99.9 * 38.95 *
 * E * ***** 1065 * 14.3 * 100.0 * 39.25 *
 * S * L * 65 * 11.1 * 99.2 * 35.91 *
 * S * S * 185 * 13.9 * 100.0 * 38.94 *
 * S * R * 142 * 13.8 * 100.0 * 38.84 *
 * S * ***** 392 * 13.4 * 99.9 * 38.40 *
 * W * L * 263 * 12.4 * 100.0 * 37.42 *
 * W * S * 529 * 15.0 * 100.0 * 39.97 *
 * W * R * 31 * 12.8 * 100.0 * 37.76 *
 * W * ***** 823 * 14.1 * 100.0 * 39.07 *
 ***** 4468 * 15.9 * 96.5 * 40.01 *

@-----
 @ R566 / M21 INTERSECTION AT GA-RANKUWA (2018). 4-WAY STOP: PM UPGRADE
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0001

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 20 1001000 0000001 YSS 0 1.00 25.00
 E 12 0100100 0000001 SSS 0 1.00 25.00
 S 12 1001000 0000001 SSS 0 1.00 25.00
 W 12 0100100 0000001 SSS 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR
 N 216 101 146 1800 1800 1800 2 3 3 5
 E 66 347 281 1800 1800 1800 2 3 3 5
 S 8 130 40 1800 1800 1800 2 3 3 5
 W 217 271 10 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * N * L * 419 * 7.6 * 78.4 * 27.17 *
 * N * S * 182 * 12.2 * 99.7 * 37.09 *
 * N * R * 312 * 12.4 * 100.0 * 37.36 *
 * N * ***** 913 * 10.1 * 90.1 * 32.63 *
 * E * L * 146 * 10.6 * 99.9 * 35.56 *
 * E * S * 702 * 12.0 * 100.0 * 37.03 *
 * E * R * 568 * 12.0 * 100.0 * 36.98 *
 * E * ***** 1416 * 11.9 * 100.0 * 36.86 *
 * S * L * 16 * 9.8 * 96.9 * 33.97 *
 * S * S * 254 * 11.9 * 100.0 * 36.85 *
 * S * R * 80 * 12.0 * 100.0 * 37.00 *
 * S * ***** 350 * 11.8 * 99.9 * 36.75 *
 * W * L * 431 * 12.0 * 100.0 * 36.96 *
 * W * S * 530 * 12.7 * 100.0 * 37.69 *
 * W * R * 26 * 11.1 * 100.0 * 36.13 *
 * W * ***** 987 * 12.3 * 100.0 * 37.33 *
 ***** 3666 * 11.5 * 97.5 * 35.92 *

@-----

```

@-----
@ <<< DEWILDT 50 MW PV SOLAR PARK >>>
@-----
@ NETW SIM VEH DELAY GEO-DEL UNIT-RATES START AMBER-GREEN PLAT FLOW
@CYCLE TIME SPAC /STOP STOP YLD DEL STOP LTIME LT ST RT FACT FACT
      120          9   9   6  1.00 25.00      2  3  3  5      1.00
@SIMTRA PARAMETERS (NOT REQUIRED BY SIMNET) -----
@PRIORITY CONTROL          FROM LEFT          FROM OPPOSITE          FROM RIGHT
@CAPACITY FACTORS      LT      ST      RT      LT      ST      RT      LT      ST      RT
*2-WAY AVERAGE      9.999  6.300  5.200  9.999  9.999  4.700  5.400  6.800  5.700
*2-WAY STD.DEV      9.999  2.600  3.100  9.999  9.999  1.100  2.600  2.200  2.900
*MINI-CIRCLE A      9.999  9.999  9.999  3.200  3.500  3.800  3.000  3.500  4.000
*MINI-CIRCLE S      9.999  9.999  9.999  1.900  2.000  2.100  1.900  2.000  2.100
*4-WAY AVERAGE      2.000  2.600  3.000  1.500  2.600  2.500  2.900  2.700  2.500
*4-WAY STD.DEV      .000   .000   .000   .000   .000   .000   .000   .000   .000
@SIMNET PARAMETERS (NOT REQUIRED BY SIMTRA) -----
@PRIORITY CONTROL          FROM LEFT          FROM OPPOSITE          FROM RIGHT
@CAPACITY FACTORS      LT      ST      RT      LT      ST      RT      LT      ST      RT
#2-WAY AVERAGE      9.999  6.300  5.200  9.999  9.999  4.700  5.400  6.800  5.700
#2-WAY STD.DEV      9.999  2.600  3.100  9.999  9.999  1.100  2.600  2.200  2.900
#4-WAY AVERAGE      0.680  0.660  0.630  0.690  0.660  0.670  0.640  0.650  0.670
#4-WAY STD.DEV      0.220  0.200  0.180  0.250  0.200  0.200  0.190  0.200  0.200
@-----
@LT,ST,RT RECOMMENDED SATURATION FLOWS
@ 1800,1800,1600 SIGNALS (1800 PROTECTED RIGHT TURN)
@ 1600,1600,1600 STOP/YIELD CONTROL
@ 1600,1600,1400 FOR LT,ST,RT AND MINI CIRCLES
@-----

```

@-----
 @ DEWILDT SOLAR PARK ACCESS R566. 2-WAY STOP: AM PEAK HOUR: 2018 TOTAL
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0032

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 99 0000000 0000000 0 1.00 25.00
 E 12 1010000 0100000 UUU 0 1.00 25.00
 S 15 1000100 0000010 SSS 0 1.00 25.00
 W 12 0010100 0001000 UUU 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR

N
 E 137 596 0 1800 1800 1800 2 3 3 5
 S 4 0 15 1800 1800 1800 2 3 3 5
 W 0 391 34 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * E * L * 284 * .0 * .3 * .11 *
 * E * S * 1196 * .1 * 1.5 * .52 *
 * E * R * 0 * .0 * .0 * .00 *
 * E * ***** 1480 * .1 * 1.3 * .44 *
 * S * L * 8 * 9.2 * 93.8 * 32.67 *
 * S * S * 0 * .0 * .0 * .00 *
 * S * R * 27 * 31.2 * 98.1 * 55.74 *
 * S * ***** 35 * 26.2 * 97.1 * 50.47 *
 * W * L * 0 * .0 * .0 * .00 *
 * W * S * 767 * .1 * .6 * .21 *
 * W * R * 72 * 6.0 * 42.5 * 16.60 *
 * W * ***** 839 * .6 * 4.2 * 1.61 *
 * ***** 2354 * .7 * 3.8 * 1.60 *

@-----
 @ DEWILDT SOLAR PARK ACCESS R566. 2-WAY STOP: PM PEAK HOUR: 2018 TOTAL
 @-----

@NODE SIGNAL OFFSET NUMBER STAGE SIGNAL-INDICATIONS SIGNAL-TIME
 @NAME TYPE# (SEC) STAGES NUMB# N E S W MIN MAX
 0032

@APPR APPR STORE LINK SPEED L,LS,S,SR,R,LR,LSR CONTR DETC UNIT-RATES
 @FROM NODE VEHS LENGTH KM/H AT-STOP ON-APPR TYPES ZONE DEL STOP
 N 99 0000000 0000000 0 1.00 25.00
 E 12 1010000 0100000 UUU 0 1.00 25.00
 S 15 1000100 0000010 SSS 0 1.00 25.00
 W 12 0010100 0001000 UUU 0 1.00 25.00

@APPR GENRAT TRAFFIC DEMAND SATURATION-FLOW START AMBER-GREEN
 PLATOON

@FROM FLOW LT ST RT LT ST RT LTIME LT ST RT
 FACTOR
 N
 E 15 379 0 1800 1800 1800 2 3 3 5
 S 34 0 137 1800 1800 1800 2 3 3 5
 W 0 484 4 1800 1800 1800 2 3 3 5

 * APPR * TURN * NO OF VEHS * DELAY * % STOPPED * COST *
 * E * L * 31 * .0 * .0 * .00 *
 * E * S * 756 * .1 * .9 * .32 *
 * E * R * 0 * .0 * .0 * .00 *
 * E * ***** 787 * .1 * .9 * .31 *
 * S * L * 60 * 11.3 * 99.2 * 36.10 *
 * S * S * 0 * .0 * .0 * .00 *
 * S * R * 280 * 53.5 * 99.8 * 78.41 *
 * S * ***** 340 * 46.0 * 99.7 * 70.94 *
 * W * L * 0 * .0 * .0 * .00 *
 * W * S * 967 * .1 * .8 * .29 *
 * W * R * 12 * .9 * 10.5 * 3.58 *
 * W * ***** 979 * .1 * 1.0 * .33 *
 * ***** 2106 * 7.5 * 16.9 * 11.72 *

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